that he can now, after two years' experience, by bringing together the facts which have occurred under his observation, arrive at the following conclusions with regard to the employment of eucalyptus.

The action of this remedy, which may certainly be considered a febrifuge, is slow and far from being always constant. In mild intermittent fever, eucalyptus is successful in four-fifths of the cases; in tertian, in three-fifths only; and, finally, in quartan fevers, it almost entirely fails: that is to say, in eight-tenths of the cases. In the seasons when intermittent fever is most frequent—that is to say, endemic—relapses are much more common when eucalyptus is used than when recourse is had to quinia. Relapses may, however, be avoided by administering eucalyptus more frequently after some days' rest only, and in as large doses as the stomach will tolerate. This remedy is perfectly inert in palustral cachexia. Finally, M. Burdel believes that in the second year of his experiments he obtained a rather larger proportion of cures and a smaller number of relapses, because he gave the eucalyptus in conjunction with good wines, iron, and quinia, and kept the organism up to its work by frequently repeated doses. Dr. Burdel administered the alcoholic extract of eucalyptus in pills, each containing 15 centigrammes, to the number of from four to ten daily, according to the form of the fever, given twice during the day.—*London Med. Record*, May 13, 1874.

12. *Action of Chloroform.*—Dr. POLLAK gives the following as his conclusions on this subject:—

1. Chloral is a very good hypnotic, and in all those diseases which consist in abnormal cerebral excitement, or are combined with this, it by its soporific influence constitutes a good calming medicine. 2. It relieves pain by the fact of inducing sleep, but will not relieve pain without causing sleep. In very intense pain it exerts but little hypnotic effect, and in such cases is advantageously combined with morphia. 3. As it induces relaxation of muscles, both voluntary and involuntary, it is an excellent means in the various forms of spasm. 4. In disease of the heart and lungs and of the digestive canal, chloral is without effect or unsuitable or even dangerous, and consequently is contraindicated, or should only be employed with caution. 5. It does not admit of being used as an anæsthetic during the execution of the great operations. 6. Its prolonged employment is not usually attended with any disagreeable effects, and if any occur, they are not of any consequence. It especially does not induce congestion of the brain or disturbance of the digestive and nutritive processes. 7. It is in most of the diseases in which it is employed an excellent palliative, but on the disease itself it usually exerts no influence. Chloral is especially indicated in the cases in which morphia is indicated, and when the latter on account of some of its effects cannot be administered. It is contraindicated in diseases of the heart and lungs and of the digestive canal. 8. Comparing chloral with morphia and chloroform, we may assert (1) that as a soporific agent its operation is more certain and less disagreeable than is that of morphia, which it will succeed in displacing as a hypnotic; (2) that it only relieves pain by inducing sleep, and fails to remove intense pain, so that as an anodyne it cannot supersede morphia; (3) and that as an anæsthetic it is far inferior to chloroform both in rapidity and intensity. 9. Although chloral has rightly obtained admission into the Materia Medica, it has not yet acquired its definitive place. Notwithstanding the numerous communications that have been made respecting it (the author is cognizant of the writings of 312 authors upon the subject), much more has yet to be worked out respecting its chemical, physiological, and therapeutical relationships before the "chloral question" can be said to be completely settled.—*Med. Times and Gazette*, April 11, from *Wiener Med. Woch.*, Feb. 28, 1874.

13. *Studies on Ether and Chloroform.*—Dr. T. G. HAKE gives (*The Practitioner* April, 1874) an interesting account of the observations made by Prof. SCHIFF, of Florence, on the action of ether and chloroform. These observations, though instituted solely for the advancement of physiological science, have a direct practical bearing on surgical practice. Prof. S. states in his

work (*Sopra il metodo seguito negli esperimenti sugli animali viventi*): "We adopt ether and not chloroform because a very extensive experience has shown that etherization pushed to the very last stage of insensibility is never dangerous to life so long as one maintains the act of respiration. And even if one presses the inhalation of ether yet further, so that the respiratory movements cease, or, in other words, the appearance of death is complete, life is never menaced, if only at the moment of the paralysis of the thoracic walls inhalation is interrupted and a species of artificial respiration is immediately commenced by means of periodic compression of the thoracic parietes themselves.

"Chloroform has been preferred to ether because it acts more quickly, and its use is more agreeable to the patient, who dislikes the odour of ether. But chloroform has a paralyzing action much greater than that of ether, and in like manner, at least in man and the mammalia generally, has a special influence on the nerves of the heart and of the vessels. If chloroform is pushed so as to produce a considerable weakening of the respiratory movements, the interruption of the inhalation may, in a majority of cases, lead to the re-establishment of respiration and afterwards of sensation; but sometimes, a short time after the commencement of inhalation, the force of the circulation is so enfeebled that it no longer renews, fast enough, the blood in the lungs. The blood of the body no longer comes into necessary contact with the atmospheric air introduced by respiration into the lungs.

"Death is sometimes sudden, but it may be preceded more or less by signs of sinking of the pressure of the blood in the vessels. The cases in which paralysis of the circulation shows itself while respiration continues are comparatively rare, but the annals of human surgery record many examples, and we have ourselves observed some in animals. If the action of chloroform is prolonged until respiration ceases, we are not even sure of being able to revive the individual after having re-established the respiratory movements, for these often again cease owing to the disturbance of the circulation, while these same movements, if restored after the inhalation of ether, become *always* more frequent in the individual when left to himself.

"We are able to say that in the present state of science the medical man *is responsible for every case of death occasioned by the application of ether*, because a careful watching of the respiration is capable of preventing death, whilst the lethal effect of chloroform depends in part on individual predisposition which the physician is unable to recognize."

Dr. Hake states that "To explain this latter statement, it should be understood that both ether and chloroform, pushed to the last stage of their action, give rise to paralysis of the respiration, vessels, heart and motor nerves, but that ether invariably produces its effects in the order of sequence now given (life of course being sustained in all cases by artificial respiration when automatic breathing has ceased); while chloroform sometimes produces paralysis of the vessels in the first instance, then of respiration, and finally of the heart. The result of the action of chloroform is thus variable; it frequently happens that its effects manifest themselves in the same order of sequence as those of ether, only much more rapidly; and it also happens that they follow each other in an inverse order as respects the first two phenomena, paralysis of the respiration and of the vessels. It is this variable action of chloroform which the physician is unable to foresee and to provide against in individual cases, and to which the danger to life is traceable. Very often at the beginning of the inhalation of chloroform by the trachea the vessels become at once paralyzed, the pulse is insensible, and death follows rapidly with a deep inspiration. All this Professor Schiff has frequently verified by experiments on dogs and rabbits, in which during inhalation the manometer has been constantly in connection with the carotid artery.

"That the heart is the last of these three factors of life which dies, the Professor clearly demonstrates in the following way. When by the action of the chloroform the pressure has gone down nearly to zero, and there is no pulsation visible, compression of the thoracic aorta between the crura of the diaphragm, or the mere compression of the abdomen, restores to the pulse its strength and frequency, and causes the pressure in the manometer to rise to a considerable height, very often to 100 or 120 millimetres. This fact proves that the heart, notwithstanding its apparent paralysis, is still able to maintain the almost normal pressure of the blood, and to contract with more strength than before when the pressure is acting upon its walls and opposing itself to their contraction. The apparent paralysis must depend on this cause; the vaso-motor nerves are paralyzed, inasmuch as all the vessels of the body are dilated; their increased capacity retains the blood, now no longer returned to the heart, which becomes bloodless in a secondary manner. Compression of the abdomen, or ligatures to the upper and lower extremities, produces a compensation for the increased capacity of the bloodvessels, and in this way the circulation becomes more normal, while before it had suffered, not through paralysis of the heart, but from paralytic dilatation of the peripheral vessels."

As regards the comparative value of ether and chloroform, Professor Schiff continues: "Our own experiments bearing on this argument enable us to say that in more than three thousand cases we have adopted etherization with a view to preserve the life of animals, and that with the few exceptions indicated elsewhere (Memoir on the Laryngeal Nerve), not a single case of death occurred. On the other hand, chloroform has cost us a considerable number of animals when I have wished to push anæsthesia to its ultimate stage.

"Our experiments confirm more and more that in etherization the pressure of the vessels maintains itself to a height almost normal and always compatible with the continuance of life even after the cessation of automatic and the substitution of artificial respiration, so that the mere continuance of breathing gives us a safe warranty of the vitality of the individual. Often in experiments made with this view, we have seen that at the moment of the cessation of automatic breathing the circulation was still in so normal a state that the commencement of asphyxia indicated still the *asphyxic height* of vascular pressure as measured by the manometer; that is, instead of falling before death, the pressure rose through the accumulation of carbonic acid, which, as is known, is an irritant of the vascular system and of its nerves.

"When, after the cessation of breathing, one at once applies artificial respiration with air that is passed over a stratum of ether, so that etherization is still kept up, one is able, by regulating the quantity of ether that is mixed with the air, to continue for hours the etherization of the animal, which no longer breathes spontaneously, without the pressure of the blood being notably diminished, and without danger to the life of the animal, which one can always resuscitate by introducing pure air into the lungs.

"It is true, however, that the pressure of the blood always diminishes slightly, so that after two hours it may have fallen, for example, from 120 to 80 millimetres; but such a fall is not prejudicial to life. One is able in these experiments to regulate with facility the quantity of ether, commencing with a low temperature of the vessel that contains it. If one finds that the animal shows a ready tendency to recommence certain automatic respiratory movements, Wolf's bottle, which contains the ether, and is connected with the bellows and manometer by means of India-rubber tubes, is brought rather nearer to the body of the animal so as to increase the heating effect.

"It is otherwise with chloroform. In animals in which, under the influence of this agent, the pressure of the blood has been examined with the manometer, one finds that the pressure is already considerably lowered before automatic respiration has ceased; and we have frequently seen the pulse disappear almost entirely in the manometer, whilst the pressure fell to 25 or 30 millimetres, and the dog still breathed spontaneously.

"In dogs in which one employs artificial respiration from the commencement, causing the air to pass through a bottle containing chloroform, so that in entering the lungs it is but feebly loaded with this agent, we have seen the pressure, sometimes immediately, sometimes after a longer period, lower itself almost to zero, while the extremely weak pulse which the manometer recorded has also ceased soon afterwards, the respiration being continued as at the beginning of the experiment. It is therefore certain that in these cases it was not the cessation of the respiration, nor its weakening, that killed the animal. This becomes yet more evident through the experiments in which, after the cessation of vascular pressure, when the pressure was that of blood almost at rest, one suddenly replaced the respiration of chloroformized air by normal air without being able to save the animal.

"After a few forced inspirations one sometimes sees the automatic breathing of the animal recommence. This may be up to two, four, and, as in one case, ten automatic inspirations; but the pressure of the blood does not rise, and the dog dies through cessation of circulation.

"Fortunately things do not always go thus. It is possible to find that a very limited quantity of chloroform mixed with the air may maintain a state of apparent death without any automatic respiration, and with an extreme fall of arterial pressure that yet admits, after half an hour's continuance of chloroformization, of the re-establishment of life on pure air being introduced. But the keeping the animal alive in such an experiment is always uncertain: we cannot make sure, as with ether, that the animal will be revived. We are never able to say, and this is a great point, what the limit of chloroform is in the inspired air, which affords us a certainty of the animal being restored."

Prof. Schiff considers that chloroform should be banished from practice as an anæsthetic agent, except in cases in which extraordinary resistance to the effect of ether shows itself, in which instances it might be allowed to mix a little chloroform with it in order to produce the commencement of anæsthesia, which should afterwards be continued with pure ether.

Prof. S. warns surgeons not to continue on operation immediately on a patient's recovery from the excessive action of anæsthetics, but to wait until respiration has been energetically restored, otherwise a new and generally fatal asphyxia may be produced.

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14. *Physiological Action of Coca.*—Dr. ALEX. BENNETT states (*Brit. Med. Journ.*, April 18, 1874) that with the aid of Messrs. Macfarlane & Co., chemists, he succeeded in obtaining a small quantity of the crystalline substance cocaine ($C_{16}H_{19}NO_4$). With this he conducted a series of experiments and observations on the lower animals, from which he ascertained that cocaine is a powerful poison with special action on the nervous system. He has also experimented with theine, caffeine, guaranine, and theobromine, with a view of determining the actions of each.

The following are his conclusions:—

1. The physiological actions of coca, tea, coffee, guarana, and cocoa, are mainly, if not entirely, due to their neutral principles.
2. Cocaine, theine, caffeine, guaranine, and theobromine are powerful poisons, inducing a series of symptoms affecting the nervous, respiratory, circulatory, vaso-motor, and glandular systems, which terminate, if the dose be large enough, in death.
3. These five principles are, to all appearances, identical in physiological action.
4. In small doses not ending fatally, these five substances produce—*a*. Cerebral excitement not succeeded by coma, and *b*. Partial loss of sensibility.
5. In large doses they produce—*a*. Cerebral excitement, *b*. Complete paralysis of sensibility, *c*. Tetanic spasms and convulsions, and *d*. Death.
6. They paralyze the entire posterior column of the spinal cord, also the entire system of peripheral sensory nerves; but the anterior columns of the cord and the peripheral motor nerves are not paralyzed.
7. They frequently produce convulsions of a clonic character, but occasionally they cause tetanic spasms, which latter are sometimes so severe as to induce opisthotonos.
8. They do not produce muscular paralysis.
9. They at first increase, then impede, and lastly stop, the respirations.
10. They at first increase, and finally diminish, both the force and frequency of the heart's contractions.
11. They produce at first contraction, and afterwards dilatation, of the capillaries and small bloodvessels, with stasis of the blood, indicating first irritation, and subsequent paralysis, of the vaso-motor nerves.